

the chitin is deposited is easily observed in many specimens where the individual is shrunk away from the wall by the reagents.

Many fine specimens of our only form of fresh water Polycistinæ, the *Clathrulina*, were found, and several interesting phases of their life history studied.

They form a fenestrated silicious shell on a long stalk, as shown in Fig. 5, Plate X. An interesting phase of their asexual reproduction was observed. The body divides, part escaping from the shell. This part then forms a new shell for itself. The stalk of the new individual forms in attachment to the old shell, and by growth gradually elongates until adult size is reached when the process is again repeated. As many as eight individuals were found thus formed a series. See text figure 9-B.

They also reproduce sexually by motile macro- and microgametes, which escape and conjugate and after a resting stage follow the usual route to maturity.

An interesting asexual stage was found, the body breaking down into three stellate resting spores, much resembling those of Desmids. See Fig. 6, Plate X. The cell wall is dissolved and the spores escape and are found in abundance in the mud.

As late as October they still remain in this stage, very likely spending most of the winter thus. Early Spring collections ought to show good stages of their development.

2. SPECULATIONS ON THE NATURE OF THE OLFACTORY ORGANS

In the vast families of insects and among other nearly related animals are found certain organs called antennæ. These are situated on the head and are generally conceded to be modified limbs, of which each segment of these forms of bodies once possessed a pair.

Such a modified pair of legs from a Black Syrphus Fly is shown in Fig. 1, Plate XI. Here, at least three segments of the limb remain. The second segment is greatly expanded laterally, forming a bulb much flattened, to which is attached the third segment in the form of a long whip-like filament.

This modified limb is supposed to be the seat of several senses; indeed, in some insects each segment is credited with a different function by some writers.

These limbs, originally used for walking, were doubtless provided with various sensory cells adapted to the necessities of their peculiar functions. The sensory cells are usually in the form of hypodermal spines of various shapes, covered with a chitinous exterior to give them greater firmness.

All the living cells of animal bodies are supposed by many students to be connected by minute filaments with the nervous system. Thus all cells are potential sensory cells, both those on the interior and exterior of the body.

By looking at the enlarged lobes of the antennæ of the fly in Fig. 1, it will be seen to be covered with small spines. Also there will be seen near the base a dark circular pit. On many insects these are very numerous and are considered as olfactory in function. These olfactory pits are invaginations of the hypoderm, and the spines on the exterior are sunk into the pits.

If we look at Fig. 2, which is a section of these pits on the antennæ of a fly, called *Sarcophaga*, we will see the pointed spines which are the sensory structures.

The sensory cells being thus sunk are much protected so that their chitin envelop may be but feebly developed, leaving them nearly naked and therefore more sensitive.

So we have here two kinds of sensory cells, the external exposed cells, and the sunken or protected cells.

It is apparently these same hypodermal spines which form the rhabdome rods in the optic invaginations of insect eyes.

If we now look at another form of limb called a palpus (See Fig. 3), from a moth, *Pieris raphae*, we will see the end of the organ is invaginated into a pit. Into this pit will be seen projecting the sensory scales, while below is the connecting nerve cord.

In Fig. 4 we get a view of the elaborate development of these pits on the antenna of a honey bee. Here the same spines are seen in the pits, also the elaborate nerve connections.

Figure 5 is a cross section of the olfactory pits on the antenna of a wasp, *Vespa*. The outer openings of these pits are closed by

elongated lips of chitin, while the pits proper are more round in shape. The naked tips of the sensory spine cells are seen in cross sections in great numbers. While these pits are regarded as olfactory, it may well be that the olfactory sense is not confined to the pit spines alone, but is only more sensitive here because of the thinness of the chitin. It may occur in some degree over the exterior.

On many Lepidoptera the males have these external sensory scales so well developed that they are enabled to pick up the trail of a female of their species by the scent she leaves in passing through the air. In such cases the antennæ are largely developed, while the shoulders and fore limbs also are covered with a special growth of scales which seem actively to function as olfactory organs.

A moth called *Chyfolisa morbidalis* has in the male a brush of enormous scales on each front leg, which exceeds the entire combined size of the head and antennæ. In this case the whole front of the body becomes a quivering agency of sex determination.

It seems reasonable that this is a case of animal tropism, the pathway of chemical particles left in the air by the female acting on the sensitive spines much as light acts on the eyes.

It is possible that this chemical sensitiveness to particles in the air is partly responsible for the irregular flight of such animals.

3. VAGINICOLA; AN INTERESTING PROTOZOAN

The form described herein is apparently related to the Vorticellidæ, a family of infusorians remarkable for beauty and variety. From their shape these animals are often called Bell-animalcules. They are attached, either temporarily or permanently, and often have a distinct stalk.

They are usually marked histologically by a long ribbon-shaped nucleus, a circle of vibratile cilia around the oral end, and by a lengthwise binary division as one of the methods of its multiplication.

The form described here was found June, 1912, in collections from Goghuac Lake, near Battle Creek. It is free, has a capsule, seemingly of a chitinous or horny nature possessed of an oval aperture. In all the specimens studied there is a pair of individuals in each capsule.